ENERGY FRONTIERS

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Publications

1. *Wong, G.K. (2017), "Geomechanics Challenges of Waterflood in Deepwater and their Relevance to Subsurface Storage of Carbon Dioxide," Hydraulic Fracturing Journal, 4 (1), pp. 86-90*

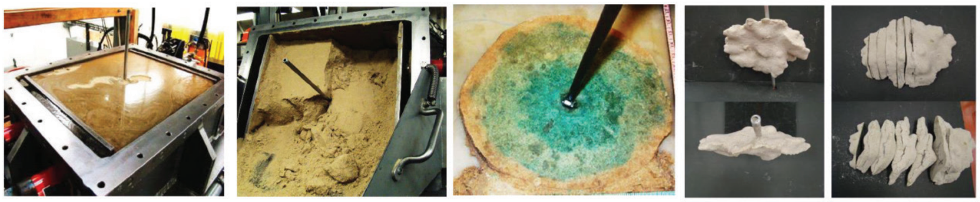
2. *Wong, G.K., Dudley, J.W., Golovin, E., Zhang, H., and Chudnovsky, A. (2017) , "Injector Completion Performance under Hydraulic Fracturing and Matrix Flooding Conditions into a Sand Pack," ARMA 17-0705 presented at the 51st US Rock Mechanics/-Geomechanics Symposium held in San Francisco, California, USA, 25-28 June, 2017*

Dr. Wong is a recipient of the SPE Distinguished Membership in 2015 and the SPE Gulf Coast Regional Completion Optimization and Technology Award in 2013. He worked as a Production Engineering Advisor and Principal Technical Expert in Sand Control and Sand Management at Shell E&P Company, USA. He has 17 years of R&D and 14 years of deepwater development and production experiences in the industry. At Cullen College of Engineering, Dr. Wong conducts research in the areas of geomechanics, well integrity and containment, completions, sand management, multiphase flows, well operations (bean-up and rampup) and monitoring for both producers and injectors.

SUBSURFACE INJECTION TECHNOLOGY

Waterflood, enhanced oil recovery, and subsurface CO2 storage projects require effective and reliable injectors. The attributes of effective injectors include sustained injectivity, flow conformance and containment. These requirements are challenging and call for a system solution that integrates new insights and practices in injection geomechanics, well completion design, surveillance, operations, and monitoring.

Dr. Wong's group is currently working with industry and academic partners on different areas of subsurface injection systems. These areas include (a) rock's constitutive behavior as a function of injection stress magnitude and unloading stress path, (b) 3-D polyaxial stress tests with an injection wellbore in unconsolidated sand to assess ramifications of water hammer and plugging solids on injectivity. The test configuration includes vertical or horizontal wellbore and at matrix or fracturing injection condition, and (c) modeling of injectors for sand control requirements and well operational and surveillance practices.



MULTIPHASE (GAS, LIQUID, AND SOLIDS) FLOW LOOP LABORATORY

Upstream exploration and production projects comprise transitioning into deeper wells and longer pay interval with multiple completions. These systems present multiphase flow challenges and improvement opportunities in (a) drilling, (b) completion, (c) production, and (d) in-well monitoring. Dr. Wong's laboratory located at the University of Houston Technology Bridge has two state-of-the-art large-size, climate controlled, multiphase flow loops that can be positioned from horizontal to vertical to evaluate these challenges. Select novel features of these flow loops are provided below.

Drilling and Completion Flow Loop

This flow loop is assembled with five acrylic tubes of up to 10 inch in diameter, for a total length of 30 feet. The system also comprises a blender with a controlled slurry concentration and a mud shaker for solids separation and thus, can handle liquid, gas, and solids. Currently, this flow loop system is being used for projects that include alpha-wave height for gravel packing using light weight proppant and gas slug movement in drilling riser.

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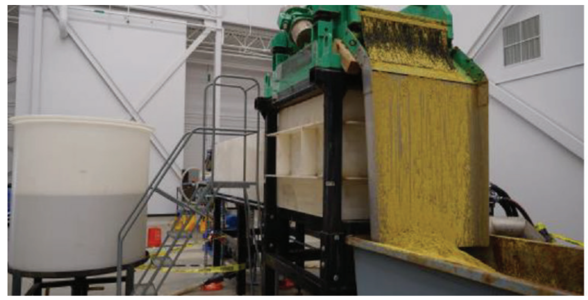

Wellbore Production or Injection Flow Loop

This flow loop comprises a 2 inch by 24 foot perforated pipe for liquid and gas flows. In addition to axial flow, the radial flow along the pipe length can be controlled independently along every foot for a total of 20 stations. Each station provides pressure, temperature, and rate measurements. The flow loop enables detailed cross flow, co-current or counter-current flow in arbitrary well inclination angles. The applications of the flow loop include calibration of wellbore sensors and Distributed Temperature Sensing (DTS) interpretation modeling.


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